APPENDIX

A

The Uncertainty of Budget Projections

The baseline projections in this report represent the most likely outcomes for the budget and the economy on the basis of current trends and current laws and policies governing taxes and spending. But considerable uncertainty surrounds those projections for two reasons. First, future legislation is likely to alter the paths of federal revenues and spending. The Congressional Budget Office (CBO) does not predict future legislation—indeed, any attempt to incorporate future legislative changes in the baseline would undermine its usefulness as a neutral base against which to measure the effects of legislation. Second, the U.S. economy and the federal budget are affected by many economic and other changes that are difficult to predict. As a result, actual budgetary outcomes will almost certainly differ from CBO's baseline projections, even after adjustments for new legislation.

This appendix explores how the accuracy of the economic and technical assumptions that CBO incorporates in its baseline can affect the accuracy of its budget projections. Looking back, the appendix describes CBO's record of projections and shows how reliable the agency's current and future five-year projections might be if they are as accurate as those of the past. Looking forward, it uses hypothetical scenarios to describe how the 10-year budget outlook might differ from CBO's baseline.

The outlook for the budget deficit or surplus (given current laws and policies) can best be described as a large spread, or fan, of possible outcomes around the single line of numbers expressing CBO's baseline. Moreover, the spread widens as the projections extend into the future. The fan in *Figure A-1* is based on CBO's record of accuracy in its five-year budget projections. The baseline budget projections presented in Chapter 1—the projections with the highest probabilities—fall in the middle of the fan. But nearby projections in the darkest part of the fan have nearly the same probability of occurring as do the baseline projections. Moreover, projections that are quite different from the baseline also have a significant probability of coming to pass. On the basis of the historical record, any budget deficit or surplus for a particular year, in the absence of new legislation, could be expected to fall within the fan about 90 percent of the time and outside the fan about 10 percent of the time. The probability that all of the next five years of deficits or surpluses will fall within the fan is less than 90 percent—closer to 70 percent, according to CBO's record.

While illustrative of the basic issues, Figure A-1 is based on a short historical record. In that short period, the budget may not have experienced all of the sources of uncertainty that it will in the future. Thus, Figure A-1 will continue to evolve with experience, over time becoming a better measure of the true uncertainty of current projections.

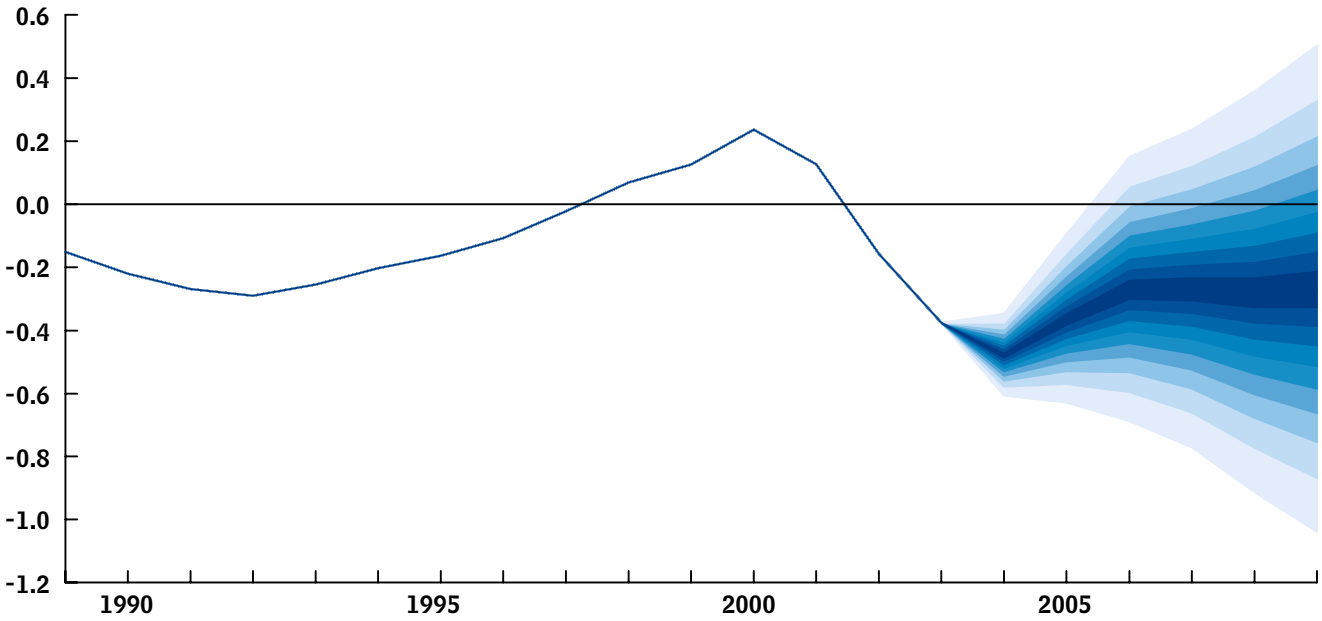
Historically, CBO's projections have been least accurate around cyclical turning points—times when the economy moves from expansion to recession or vice versa—which economists generally have the most difficulty predicting reliably. However, from 1981 (the earliest year for which complete data suitable for this analysis are available) until 2003, the economy experienced just three recessions (in 1981 and 1982, 1990 and 1991, and 2001) and only two long expansions. Thus, CBO has limited information on the uncertainty associated with its projections around turning points.

In addition to the timing and magnitude of cyclical turning points, the longer-run economic and budgetary trends that underlie the 10-year outlook involve uncertainty. For example, measuring and forecasting the potential growth of the economy—an important part of the

Figure A-1.

Uncertainty of CBO's Projections of the Budget Deficit or Surplus Under Current Policies

(Trillions of dollars)



Source: Congressional Budget Office.

Note: Calculated on the basis of CBO's track record, this figure shows the estimated likelihood of alternative projections of the deficit or surplus under current policies. The projections described in Chapter 1 fall in the middle of the darkest area. Under the assumption that tax and spending laws and policies do not change, the probability is 10 percent that the actual deficit or surplus for each year will fall in the darkest area and 90 percent that it will fall within the whole shaded area. The probability that all of the next five years of deficits or surpluses will fall within the fan is less than 90 percent—closer to 70 percent, according to CBO's record.

Actual deficits or surpluses will of course be affected by legislation enacted in coming years, including decisions about discretionary spending. The effects of future legislation are not included in this figure.

For an explanation of how CBO calculates the probability distribution underlying this figure, see *Uncertainties in Projecting Budget Surpluses: A Discussion of Data and Methods* (April 2003), available at www.cbo.gov; an update of that publication will be available shortly.

10-year projections—require making assumptions about many factors that affect the growth of capital, the labor supply, and total factor productivity (which reflects the productivity of both capital and labor combined). Even small changes in the projected growth rate of potential output can have significant budgetary implications over the course of 10 years. Much uncertainty surrounds factors such as the gains in productivity from more efficient use of the capital already acquired, the pace of future technological improvements in IT (information technology) equipment, the impact of changes in the educational status of workers, the effect of undocumented immigration on the size and skills of the labor force, the implications of changes in work and retirement patterns, and developments in the world economy.

In the absence of a sufficient historical record to construct a fan chart, a way to illustrate the uncertainty of 10-year projections is to calculate the effects of specific sets of alternative assumptions on the outlook for the economy and the budget. For that purpose, CBO has assembled two scenarios that differ primarily in their assumptions about cyclical conditions in the next few years, the level of total factor productivity, the revenues arising from a given level of overall economic activity, and the growth of medical costs over the next decade. The range of outcomes is very large for the 10-year projections, and about two-thirds of the effects of uncertainty occur in the last five years of the projection period.

The Accuracy of CBO's Past Budget Projections

Baseline budget projections are bound to deviate from actual outcomes, but assessing the accuracy of previous projections is not a simple matter. As described, baseline projections are meant to serve as a neutral reference point for evaluating policy changes, so they make no assumptions about future legislation that might alter current budget policies. To focus on the accuracy of the baseline as a reference point, this appendix presents inaccuracies in projecting that stem from economic and technical factors and exclude the estimated effects of new legislation.

CBO assessed the accuracy of its past annual projections by comparing them with actual budgetary outcomes and attempted to determine the sources of differences after adjusting for the estimated effects of policy changes *(see Box A-1).* The comparisons included 22 sets of projections for the ongoing fiscal year (the one in which the projections were made), 21 sets for the following fiscal year (referred to as the budget year), and 17 to 20 sets of projections that extend four more years into the future.[1] CBO used only the first five years of projections because its record of 10-year projections is not long enough for drawing conclusions.

On average, the absolute difference (without regard to whether the difference was positive or negative) between CBO's estimate of the federal deficit or surplus and the actual result was 0.5 percent of gross domestic product (GDP) for the ongoing fiscal year and 1.2 percent for the budget year; by the fourth year beyond the budget year, that difference, adjusted for the effects of subsequent legislation, rose to 3.0 percent *(see Table A-1).* If those averages were applied to CBO's current baseline, the actual deficit or surplus could be expected to differ in one direction or the other from the corresponding projection by roughly $60 billion in 2004, $140 billion in 2005, and $440 billion in 2009, aside from the effects of legislative changes.

Misestimates of revenues have generally been larger than misestimates of outlays, reflecting the greater sensitivity of revenues to economic developments. In absolute terms, revenue projections differed from actual outcomes by an average of about 2.1 percent for the current year, 4.9 percent for the budget year, and 10.9 percent for the fourth year beyond the budget year. Inaccuracies in outlay projections were about a third smaller than those in revenue projections for the current year and between a third and a half as large for the budget year and subsequent years. (Those inaccuracies in outlays include misestimates of spending for net interest, which are significantly affected by the misestimates of revenues.)

The misestimates of the budget's bottom line have gone in both directions: sometimes the projections have been too high and at other times too low. On average, CBO's projection of the deficit or surplus has tended to be slightly pessimistic for the current year (that is, CBO overestimated deficits), on the mark for the budget year, and slightly optimistic for the other four years.

Similar conclusions can be drawn from looking at the history of CBO's estimates of the primary surplus—the total budget surplus excluding net interest—for each of the 17 (six-year) baseline projections in the sample period *(see Figure A-2 on page 100)*.[2] In each case in Figure A-2, the shaded cone corresponds to an area similar to that shown by the fan in Figure A-1, which is likely to cover the actual outcome about 90 percent of the time for each year in the projections. Both figures reflect a statistical analysis of CBO's past misestimates of revenues and outlays.[3] Misestimates above the center of the cones in Figure A-2 represent instances in which CBO underestimated the primary surplus, whereas misestimates that lie below the center of the cones are times when CBO overestimated

1. The projections are those made in July 1981 and CBO's winter projections (usually published in January) from 1983 through 2003. Insufficient data were available to use projections made before 1981 or the projections made in early 1982. For projections made in 1998 and before, a full five years of estimates could be used. For projections made since that date, progressively shorter spans of estimates were used because the most recent actual data against which they could be compared were for fiscal year 2003. To calculate the role of policy changes, CBO used estimates of the budgetary effects of legislative changes that were made close to the time that the legislation was enacted. (CBO has also examined in detail its record of economic forecasting. See Congressional Budget Office, *CBO's Economic Forecasting Record* [October 2003], available at www.cbo.gov.)

2. CBO's analysis focuses on the primary surplus because including net interest would muddy the comparisons, as the relationship between budget balance and interest costs depends on interest rates, which vary.

3. See Congressional Budget Office, *Uncertainties in Projecting Budget Surpluses: A Discussion of Data and Methods* (April 2003), available at www.cbo.gov. An updated version will be available shortly.

Box A-1.

How CBO Analyzed Its Past Misestimates

This appendix distinguishes inaccuracies in budget projections that are correlated with the business cycle from inaccuracies in assessing trends that are unrelated to the business cycle.[1] That distinction is useful because inaccuracies in the assessment of trends are likely to grow indefinitely as the projection horizon extends, but inaccuracies correlated with the business cycle are not. In fact, according to the Congressional Budget Office's (CBO's) estimates, cyclical inaccuracies are small in the first two years of a projection period (that is, the current year and the budget year); for those two years CBO attempts to reflect its view of the business cycle in its projection. Those inaccuracies plateau for the next three years of the projection period, for which time CBO does not attempt to forecast the business cycle. The remaining inaccuracies grow almost linearly with the projection horizon. According to that decomposition, discrepancies between CBO's budget projections five years out and actual outcomes have consisted in roughly equal parts of discrepancies due to business cycles (which CBO does not attempt to project so far in advance) and inaccuracies in assessing the economic and other trends that underlie the budget.

For the purpose of this appendix, discretionary spending is handled somewhat differently than in CBO's usual analyses of revisions to budget projections. In its analyses of revisions, CBO allots any discrepancies between assumptions and outcomes to three categories: the effects of legislation, economic factors, and technical (estimating) factors. (For more details about those categories, see Chapter 1.) Discretionary spending is appropriated annually through new legislation, and as a result, legislation accounts for the lion's share of the differences between baseline projections and actual outlays for discretionary programs. But the split for discretionary spending is not available consistently throughout all of the historical record that CBO analyzes in this appendix. For that reason, CBO has excluded the small misestimates in discretionary spending for other (nonlegislative) reasons from its discussion of uncertainty here. Because economic and technical assumptions play only a small role in projections of discretionary spending, that omission makes very little difference to the results.

The discussion in this appendix also omits any distinction between economic and technical differences. That distinction is somewhat arbitrary, subject to change as the underlying economic data are revised, and unnecessary for this analysis.

1. A detailed discussion appears in *Uncertainties in Projecting Budget Surpluses: A Discussion of Data and Methods* (April 2003), available at www.cbo.gov. An updated version of that document will be available shortly.

the primary surplus—in all cases, apart from the effects of subsequent legislation.

As Figure A-2 shows, CBO's baseline projections have generally been less accurate for the out-years than in the short run. Although the five-year budget projections made between 1993 and 1998 tended to be too pessimistic, those made earlier tended to be too optimistic. In 13 of the 17 cases (or about three-quarters of the time), all of the misestimates of the primary deficits or surpluses for a particular baseline fell within the fan.

Sources of Past Inaccuracies in Projecting Revenues

Misestimates of revenues are rarely attributable to a single cause, but a few major factors can be identified. Both unexpected recessions and unexpectedly rapid expansions can be a problem for revenue projections—as noted earlier, predicting turning points in the business cycle is one of the most difficult challenges facing economic fore-

Table A-1.

Average Difference Between CBO's Budget Projections and Actual Outcomes Since 1981, Adjusted for Subsequent Legislation

(Percent)

	Year for Which the Projection Was Made					
	Current Year	Budget Year	Budget Year + 1	Budget Year + 2	Budget Year + 3	Budget Year + 4
Difference as a Percentage of GDP						
Deficit or Surplus						
Average difference[a]	0.2	0	-0.2	-0.2	-0.3	-0.4
Average absolute difference	0.5	1.2	1.7	2.1	2.5	3.0
Revenues						
Average difference	0	-0.1	-0.3	-0.3	-0.4	-0.5
Average absolute difference	0.4	0.9	1.4	1.6	1.8	2.0
Outlays						
Average difference	-0.2	-0.2	-0.1	-0.1	-0.1	-0.1
Average absolute difference	0.3	0.4	0.6	0.7	1.0	1.2
Difference as a Percentage of Actual Outcome						
Revenues						
Average difference	-0.2	-1.0	-2.2	-2.1	-2.4	-3.4
Average absolute difference	2.1	4.9	7.5	8.5	9.4	10.9
Outlays						
Average difference	-0.9	-0.8	-0.8	-0.9	-0.6	-1
Average absolute difference	1.4	2.1	2.9	3.5	4.7	5.9

Source: Congressional Budget Office.

Notes: This comparison covers the projections that CBO published in July 1981 in *Baseline Budget Projections: Fiscal Years 1982-1986* and the ones it published each winter between 1983 and 2003 in *The Economic and Budget Outlook.*

The current year is the fiscal year in which the projections are made; the budget year is the following fiscal year.

Differences are actual values minus projected values. Unlike the average difference, the average absolute difference indicates the distance between the actual and projected values without regard to whether the projections are overestimates or underestimates.

a. A positive average difference for the deficit or surplus means that, on average, CBO overestimated the deficit or underestimated the surplus; and a negative average difference, the opposite.

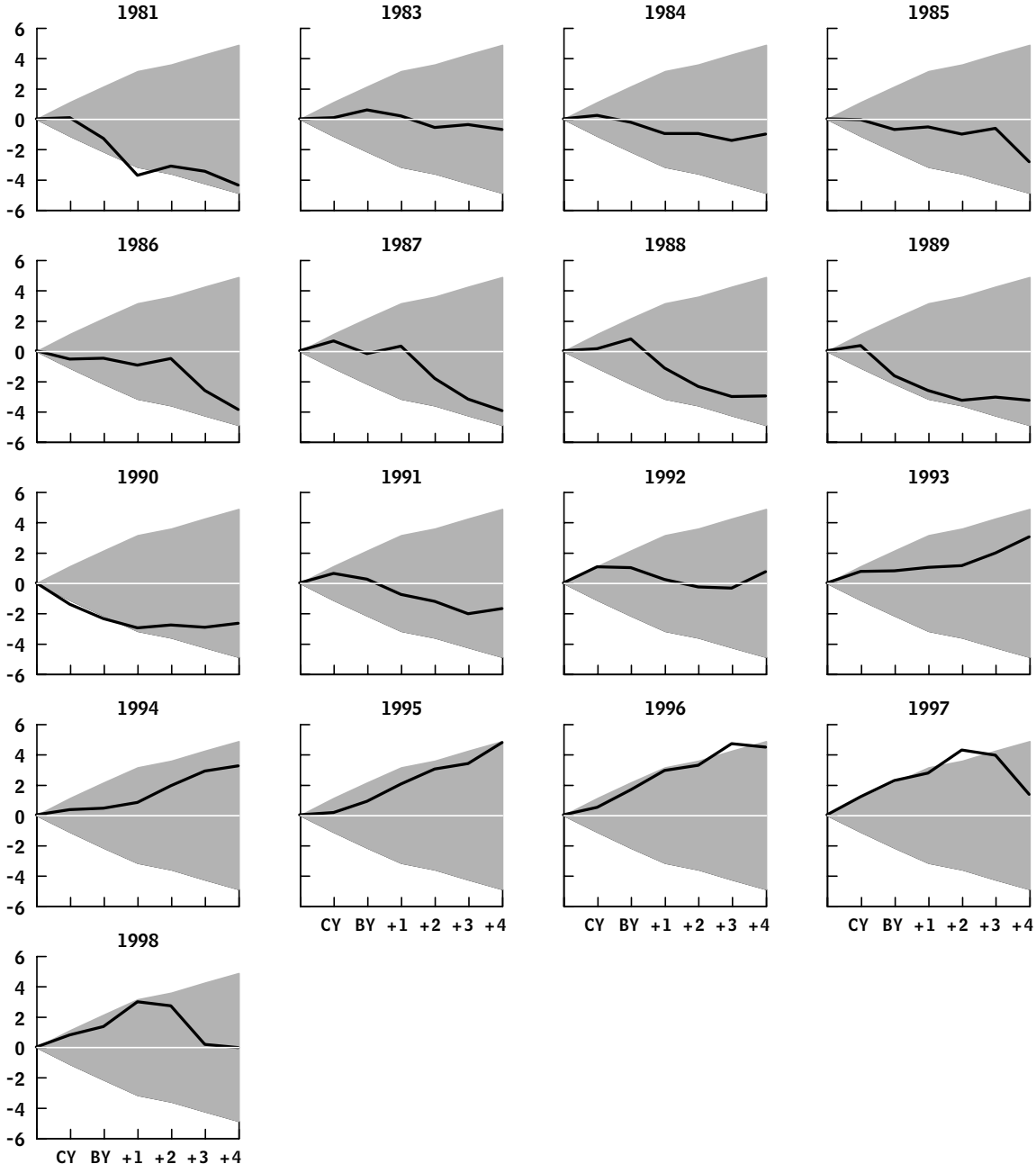
casters. Therefore, revenues tend to be overestimated in projections done just before recessions and underestimated in projections made before rapid expansions. The major source of inaccuracies in revenue projections made during the economic expansion of 1995 through 2000 was the failure to predict the apparent acceleration in the trend of growth in the economy and the economic changes associated with it. In particular, the boom in the stock market boosted tax revenues as investors began to realize their capital gains. At the same time, the income of households in the highest tax brackets grew faster than income did on average, raising effective tax rates.

The unexpected shortfall in receipts from 2001 through 2003 appears to result at least in part from some unwinding of the same factors that pushed receipts up above expectations in the 1995-2000 period. According to the data that are available thus far, capital gains realizations fell sharply in 2001 and 2002, and effective tax rates on income besides capital gains fell in 2001, as high-income taxpayers saw their income grow more slowly than did other taxpayers, who faced lower marginal tax rates. (More information on the sources of the shortfall will become available when data from tax returns for 2002 are tabulated this summer.)

Figure A-2.

Misestimates in CBO's Projections Made from 1981 to 1993

(Percentage of GDP)



Source: Congressional Budget Office.

Notes: CY = current year; BY = budget year.

This figure shows misestimates in CBO's projections of the primary deficit or surplus—the total deficit or surplus excluding net interest—made at different times. Plotted points that lie below the center line reflect instances in which CBO underestimated the primary deficit or overestimated the primary surplus, whereas points above the center line reflect the opposite. In each panel, the shaded cone indicates the estimated 90 percent confidence band; that is, there was a 90 percent chance that CBO's projection would be within the shaded area. CBO estimated that confidence band on the basis of its track record since 1981 (excluding 1982, because of insufficient data).

The figure excludes the effects of legislation enacted after the projections were made.

Sources of Past Inaccuracies in Projecting Mandatory Outlays

CBO often overestimated inflation in its projections in the early 1980s, and more recently, it anticipated an upturn in inflation during the late 1990s that did not occur. Estimates of inflation that are too high result in overestimates not only of cost-of-living adjustments for beneficiaries of many federal programs but also of reimbursements for health care providers. CBO also overestimated unemployment rates in the 1990s, leading to corresponding overstatements of caseloads for means-tested benefit programs (such as the Food Stamp program).

Misestimates of those broad economic trends, however, accounted for only part of the inaccuracies in past projections of mandatory outlays. The remainder came from inaccurate assumptions about such factors as what proportion of eligible individuals and families would participate in benefit programs, how sound financial institutions would be, and how health care providers would behave—factors that can be extremely difficult to predict. For example, along with other analysts, CBO did not fully anticipate the deposit insurance crisis of the 1980s, and the year-by-year costs for its cleanup were highly variable and hard to estimate. Similarly, CBO did not completely foresee the extent of states' use of creative financing mechanisms to obtain federal Medicaid funds between the late 1980s and the late 1990s, or the temporary slowing of the growth of Medicare costs in the late 1990s.

Alternative Economic and Budget Scenarios

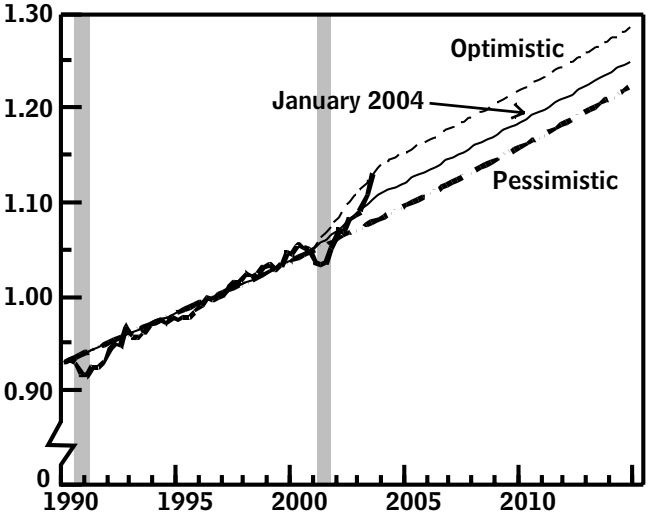
The fan chart is a comprehensive summary of the uncertainty surrounding five-year projections. A way of looking at the uncertainty of today's 10-year projections is to consider how different scenarios could affect the budgetary outcomes. Those alternative scenarios can provide a qualitative, if less comprehensive, understanding of how budget projections can miss the mark, although assigning probabilities to the various outcomes is generally not possible. CBO developed two alternative scenarios that imply significantly different paths for the budget. Each scenario shows the effects of three economic or budgetary developments that occur at the same time. Although each development is plausible in isolation, the chance of all three occurring together is very small.

The alternative economic scenarios primarily reflect opposing views regarding the effect of the recent surge in productivity on the level of potential gross domestic product, or GDP *(see Figure A-3).* The optimistic scenario used here assumes a level of potential GDP that reflects all of the recent surge in productivity but holds the growth rate of potential output after 2004 at roughly that of CBO's economic baseline projection. As a result, the level of potential GDP is higher throughout the 10-year projection period. By contrast, the pessimistic scenario assumes that none of the recent surge in productivity is permanent, and thus it has no effect on the level of potential GDP. Consequently, the level of potential GDP in the pessimistic scenario is below that of CBO's baseline throughout the projection period, although its growth rate after 2005 is also roughly the same as in the baseline.

Figure A-3.

Total Factor Productivity in the Baseline and Alternative Scenarios

(Index, 1996 = 1.0)



Source: Congressional Budget Office.

The two scenarios also contain different sets of technical assumptions, one for revenues and one for outlays. In particular, the technical assumption for revenues is that the revenue yield for a given set of economic assumptions is either higher (in the optimistic scenario) or lower (in the pessimistic scenario) than that of the baseline. The technical assumption for outlays is that the growth of costs for Medicare and Medicaid will be slower (optimistic) or faster (pessimistic) than in the baseline, for a given set of economic assumptions.

Finally, the alternative scenarios reflect different assumptions about the rate of growth of the GDP price index relative to the consumer price index for all urban consumers (CPI-U), a relationship that is important for budget projections. If the GDP price index grows rapidly in comparison to the CPI-U, projections of revenue growth will be stronger relative to projections of outlay growth. The optimistic scenario assumes that growth of the GDP price index is the same as that of the CPI-U; the baseline assumes that the former will grow relatively more slowly over the medium-term projection; and the pessimistic scenario, that the former will grow even more slowly in relative terms.

The two scenarios show a wide range of possible budgetary outcomes. In comparison with CBO's baseline, the optimistic scenario implies a cumulative surplus that is roughly $4 trillion (or 13 percent of total outlays) greater over the 10 years from 2005 through 2014, whereas the pessimistic scenario implies a cumulative deficit that is about $4 trillion less. In each case, close to two-thirds of the difference occurs in the last five years.

In the optimistic scenario, about half of the improvement over the 2005-2014 period stems from the optimistic economic assumptions, and roughly a third results from the optimistic technical assumptions for revenues that specify a higher revenue yield for a given set of economic assumptions. The rest is attributable to the optimistic assumptions about slower growth of Medicare and Medicaid costs. As would be expected, the budgetary effects of the pessimistic scenario are approximately the opposite of those of the optimistic scenario.